Patent Claims

1. A fuel cell having a membrane electrode assembly (MEA), anode-side and cathode-side bipolar plates with guide passages for reactants and guide passage structures for a cooling medium, characterized in that the distributor structure of the guide passages (flowfield) for the reactants of the anode and/or cathode is divided into at least two fields (1, 2), each field (1, 2) having entry ports (3a, 4a; 5a, 6a) and exit ports (3b, 4b; 5b, 6b) for the reactants.

2. The fuel cell as claimed in claim 1, characterized in that at least one exit port (3b, 4b) of one field (1) is connected to an entry port (5a, 6a) of another field (2).

3. The fuel cell as claimed in claim 2, characterized in that a feed line (9, 10) for introducing operating substances, preferably reactants, is present in the region of the connection between exit port (3b, 4b) of the one field (1) and entry port (5a, 6a) of the other field (2).

4. The fuel cell as claimed in claim 1, 2 or 3, characterized in that at least two fields (1, 2) have separate entry and exit ports for the cooling medium.

5. The fuel cell as claimed in claim 4, characterized in that there are means which can be used to set the flow rate and/or condition of the cooling medium separately for at least two fields (1, 2).

6. The fuel cell as claimed in claim 4 or 5, characterized in that at least one cooling medium exit port of one field is connected to a cooling medium entry port of another field.

7. The fuel cell as claimed in one of claims 1 to 6, characterized in that there are means which can be used to set the flow rate and/or composition of the reactants separately for at least two fields (1, 2).

8. The fuel cell as claimed in one of claims 1 to 7, characterized in that at least one of the fields, preferably each of the fields, has a temperature sensor.

9. A method for operating a fuel cell which has the features of one of claims 1 to 8, characterized in that the partially consumed reactant which emerges from the exit port (4b) of the cathode structure of one or more fields (1) is mixed with fresh reactant and fed to the cathode structure of one or more other fields (2) via corresponding entry ports (6a).

10. A method for operating a fuel cell which has the features of one of claims 1 to 8, characterized in that the partially consumed reactant which emerges from the exit port (3b) of the anode structure of one or more fields is mixed with fresh reactant and fed to the anode structure of one or more other fields (2) via corresponding entry ports (5a).

11. A method for operating a fuel cell which has the features of one of claims 4, 5 and 6, characterized in that the cooling medium which emerges from one or more fields is mixed with fresh cooling medium and fed to one or more other fields via corresponding cooling medium entry ports.

12. The method as claimed in claim 11, characterized in that at least two fields (1, 2) are operated with different cooling media (e.g. air, water).

13. The method as claimed in claim 11 or 12, characterized in that cooling media with different temperatures and/or flow velocities are used for at least two fields (1, 2).

14. The method as claimed in one of claims 9 to 13, characterized in that anode and/or cathode reactants with different properties (e.g. composition, mass flow) are used for at least two fields (1, 2).

15. The method as claimed in claim 13 or 14, characterized in that the temperature of each field (1, 2) is measured and is used to control the fuel cell by changing composition and/or flow rate of the reactants and/or of the cooling medium.

16. A method for operating at least two stacks of fuel cells which have the features of one of claims 1 to 8, characterized in that reactants and/or cooling medium are successively passed via fields (1, 2) of cells belonging to different stacks.